Ontario Geological Survey

Northern Ontario
Engineering Geology Terrain Study 55

MARMION LAKE AREA

(NTS 52B/NW)

District of Rainy River

by

D.G. Mollard and J.D. Mollard

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FIGURE

1 - Map of the Quetico-Nipigon area showing moraines and orientation of glacial features 3

MAPS
(accompanying report)

Map 5073 (coloured) - Northern Ontario Engineering Geology Terrain Study, Data Base Map, Marmion Lake (NTS 52B/NW). Scale 1:100 000.

Map 5104 (coloured) - Northern Ontario Engineering Geology Terrain Study, Terrain Conditions for General Construction Map, Marmion Lake (NTS 52B/NW). Scale 1:100 000.

Northern Ontario

Engineering Geology Terrain Study 55

MARMION LAKE AREA

(NTS 52B/NW)

District of Rainy River

by

D.G. Mollard[1] and J.D. Mollard[2]

1.0 INTRODUCTION:

This report contains an inventory of regional engineering terrain conditions in the Marmion Lake map-area, District of Rainy River. The area, which covers NTS block 52B/NW, lies between Latitudes 48°30′N and 49°00′N and Longitudes 91°00′W and 92°00′W. The report forms part of a series of publications that provide similar terrain data for some 370 000 km^2 of northern Ontario.

The purpose of the inventory is to assist regional engineering and resource planning studies at a level of detail consistent with a scale of 1:100 000.

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The terrain information is contained on the Data Base Map (OGS Map 5073, accompanying this report). The Terrain Conditions for General Construction Map (OGS Map 5104, accompanying this report) is a derived map which illustrates the suitability of the terrain in the Marmion Lake map-area for such activities as foundation construction, excavation, and road construction.

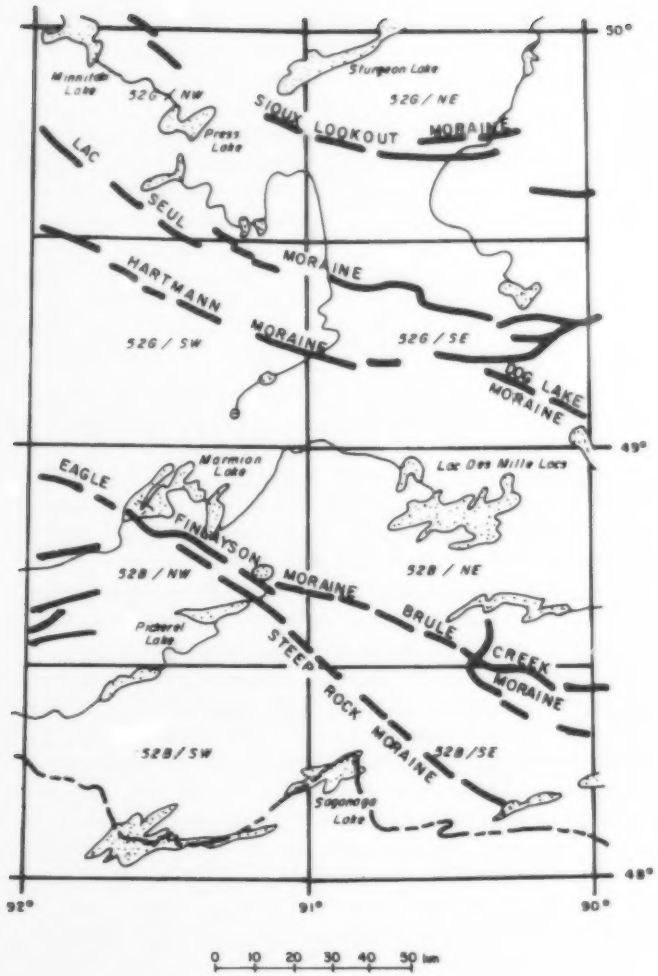
Interpretation of black and white aerial photographs, at a scale of approximately 1:50 000, formed the basis of the terrain mapping process. The interpretation was checked against published and unpublished maps and reports which documented previous field visits and observations. During the fall of 1978, roads in the map-area were traversed and observed terrain conditions recorded as further verification of the office studies. Thus, the Data Base Map represents a reconnaissance overview of the engineering conditions of the terrain.

An engineering terrain legend was developed to facilitate the mapping and to provide a common information base for the entire map series. This legend is shown on the accompanying Data Base Map. Further discussion on the mapping techniques, legend format, and possible uses of this engineering geology information is available in the Ontario Engineering Geology Terrain Study Users' Manual (Gartner, Mollard, and Roed 1980), a companion publication to this series of maps and reports.

2.0 PHYSIOGRAPHY AND GEOLOGICAL SETTING:

Local relief in the Marmion Lake map-area rarely exceeds 60 m and is commonly less than 45 m. Relief is greatest near Quetico Lake and Pickerel Lake, in the southwestern and south-central parts of the area respectively. Lakes cover one-quarter to one-third of the map-area. Their highly irregular shorelines indicate that bedrock outcrops occur at many places around the lakes. The southern third of the map-area lies within Quetico Provincial Park.

The Eagle-Finlayson Moraine (Figure 1) extends through the map-area in an east-southeasterly direction from Turtle Lake in the northwest corner to French Lake in the southeastern part. The Steep Rock Moraine parallels the Eagle-Finlayson, 2 to 4 km south of it, from the central part of the area to the southeast corner. Large glaciofluvial deposits are associated



NOTE: Moraine segments shown in the figure do not necessarily all occur on the Data Base Map accompanying this report.

FIGURE 1 - MAP SHOWING MAJOR MORAINES IN NTS 52B AND 52G (MODIFIED FROM ZOLTAI 1965, FIGURE 3)

with these moraines. Topography in the map-area is controlled by the underlying bedrock. In general, a thin patchy layer of drift covers the irregular bedrock surface. Along the north side of Cirrus, Batchewaung, and Pickerel Lakes, the drift cover thickens. North of this, bedrock outcrops are interspersed with a thin layer of drift over the bedrock.

A belt of mafic to intermediate metavolcanics and metasediments trends east through the central part of the map-area. An offshoot of this belt, consisting mainly of metavolcanics with some metasediments, extends northeast through Steep Rock Lake and Finlayson Lake to the northern margin of the area. The remainder of the map-area is underlain by felsic igneous and metamorphic rocks.

3.0 ENGINEERING TERRAIN UNITS:

The engineering terrain units mapped are identified in terms of four components: surface material, landform, topography, and drainage. Format of the legend used in the terrain mapping is described in detail in the Users' Manual (Gartner, Mollard, and Roed 1980). Landform is a very important component because surface and near-surface materials, topographic expression, and surface and internal drainage conditions are all related to it. Consequently, the engineering terrain units are grouped, for descriptive purposes, according to the dominant landform.

A particular landform can occur as the only component in a simple terrain unit, or as a dominant or subordinate component in a complex terrain unit. The dominant landform usually occupies more than half of a complex terrain unit. Where only one subordinate landform is shown, it usually occupies between 10 and 50 percent of the complex unit. Where two subordinate landforms are shown, the first covers the larger area. Landforms that occupy less than 10 percent of the terrain in a complex unit are rarely indicated in the terrain unit letter code. Where two or three landforms in a complex terrain unit consist of the same material, the landform letter symbols are connected by a dash. Examples of terrain unit letter codes which may occur in this map-area, and an explanation of each, are given in the Appendix.

A large number of complex terrain units has been mapped due to the widespread occurrence of irregular topography. Bedrock, which is situated

at or near the ground surface throughout much of the map-area, controls the topography and therefore the surface drainage conditions. Resource development and engineering planning considerations are complicated by these complex conditions.

Noteworthy occurrences of important landforms are described with respect to location, typical materials, topography, and drainage; their significance in geotechnical investigations, regional engineering planning, and resource development is summarized.

3.1 BEDROCK KNOB (RN):

3.1.1 Description:

Bedrock knob landscape (RN) is characterized by an irregular bedrock surface having complex multiple slopes of varying steepness. The cover of glacial deposits overyling the bedrock knobs is generally thin and discontinuous. Much of the glacial overburden consists of a bouldery, sand-rich till that was transported only a short distance by the ice.

3.1.2 Occurrence:

Bedrock knobs (RN) are the most common bedrock landform in the Marmion Lake map-area and occur extensively throughout the area, except for the south-central and extreme southwestern parts. The cover of glacial debris on these bedrock knobs is usually thin. The landform occurs in association with ground moraine (RN(MG)) and with ground moraine and glaciolacustrine plain (RN(MG)(LP)). However, bedrock knobs are most commonly associated with organic terrain (RN(OT)). They are also found in association with bedrock ridges (RR), and rarely with hummocky moraine (MH) and kames (GK). The bedrock knobs have developed mainly on felsic igneous and metamorphic rocks (e.g. granite, syenite, granite gneiss).

3.1.3 Engineering and Planning Significance:

Two principal engineering considerations are the large volumes of rock that must be excavated during construction and the generally uniform and

solid foundation conditions at shallow depths. However, due to difficult topography and the existence of rock fractures, bedrock knob terrain is considered poor for most types of light construction and for waste disposal. Drilling and blasting are required during the construction of almost all types of engineering works.

3.2 BEDROCK PLAIN (RP):

3.2.1 Description:

The bedrock plain unit (RP) has a low-lying, undulating to rolling surface. The bedrock is generally mantled by a thin and variable cover of glacial material, consisting mainly of boulder-rich, sandy till. The rock plains display considerable local variation. They may consist of bare bedrock or may be covered by till or fine-grained water-laid deposits.

3.2.2 Occurrence:

Large bedrock plains (RP) are located throughout the southern half of the map-area, particularly northwest and northeast of Cirrus Lake in the western part, in the vicinity of Nym Lake in the central part, and in a broad belt extending from Kasakokwog Lake in the west to Pickerel Lake in the east. The mantle of drift is thin over these bedrock plains. Commonly associated subordinate landforms include bedrock knobs (RN), organic terrain (OT), and ground moraine as a thin mantle over bedrock (MG/R).

3.2.3 Engineering and Planning Significance:

Engineering and construction problems relate mainly to the cost of bedrock excavation. Foundation materials are strong, have a low compressibility, and a permeability that is controlled almost entirely by rock fractures. Bedrock plains are poor construction and waste disposal sites, but are still considered better than areas mapped as bedrock plateau (RL), bedrock knob (RN), or bedrock ridge (RR). Drainage courses tend to follow eroded zones of weakness in the underlying bedrock. Many of these depressions occupy preglacial channels that were enlarged by glacial

erosion. A large proportion of the ground water in this landform is confined to fractures in the upper 45 to 60 m of bedrock. Permeability varies from impervious to highly pervious, depending on the spacing, depth, and width of fissures in the bedrock. Rock materials have high compressive, shearing, and bearing strengths. Position of the water table varies with topography, being closer to the surface beneath depressions. By careful route selection and proper design of vertical alignment, rock cuts on lower class roads can be avoided or at least the volume of rock to be blasted can be minimized. This is possible because of the low relief surfaces associated with many of the bedrock plains.

3.3 BEDROCK RIDGE (RR):

3.3.1 Description:

The bedrock ridge unit (RR) consists of long, narrow, subparallel and intersecting bedrock ridges of varying height. Thickness of drift over the masked bedrock surface varies substantially over short distances. In general, it is relatively thin (1 to 2 m) on ridge tops and thicker on the lower slopes and in the depressions between rock ridges.

3.3.2 Occurrence:

Bedrock ridges (RR) have formed in Early Precambrian mica schists, slates, and greywackes belonging to a narrow belt of metasediments extending through Jean Lake in the southwestern part of the map-area. The mantle of glacial materials on ridge crests is thin or absent. Peat occurs in many depressions between the bedrock ridges. Commonly associated subordinate landforms are bedrock knobs (RN), organic terrain (OT), and ground moraine as a thin mantle over the bedrock (MG/R).

3.3.3 Engineering and Planning Significance:

The main construction problem is the large quantities of very hard rock that must be excavated during construction. Drilling and blasting costs can be very high. Bedrock ridge terrain is considered poor for most types of engineering, construction, and resource development. It also has a low

rating for waste disposal due to irregular relief, the presence of rock fractures near the ground surface, and the high cost of earthwork construction.

3.4 END MORAINE (ME):

3.4.1 Description:

End moraine (ME), which forms either prominent or inconspicuous till ridges, was deposited along the margin of the glacier. Although the ridges are usually long and narrow, they can be hummocky in places. End moraine consists largely of ice-deposited till and boulders, with minor inclusions of water-laid silt, sand, and gravel. Segments of end moraine, composed mainly of till, occur with hummocky moraine (MH), kames (GK), and ice-contact deltas (GD) in large moraine complexes which are identified by name in Figure 1. The bedrock surface is nearly always buried in areas of end moraine; however, there are exceptions, and in a few places end moraine ridges have a core of solid rock.

3.4.2 Occurrence:

End moraine (ME) forms portions of both the Eagle-Finlayson Moraine and the Steep Rock Moraine (Figure 1). The Eagle-Finlayson Moraine extends through the map-area in an east-southeasterly direction from Turtle Lake in the northwest corner to French Lake in the southeastern part. It is composed largely of coarse sorted and stratified drift deposits (GK and GD) with some end moraine (ME). The Steep Rock Moraine parallels the Eagle-Finlayson, 2 to 4 km south of it, from the central part of the area to the southeast corner. In contrast, this moraine consists largely of unsorted and unstratified bouldery till deposits. End moraine can occur as either the dominant or subordinate landform in complex terrain units.

3.4.3 Engineering and Planning Significance:

An important characteristic of end moraines is their variability. Layers of unsorted and unstratified material of varying sizes (*i.e.* till) can both underlie and overlie sequences of layered silt, sand, and gravel. In general,

the boulder content of this landform is high. End moraines in the map-area commonly exhibit variable permeability and internal drainage, low compressibility, and high bearing strength. The water table is low in end moraine ridges. Where the unit consists of till that is high in sand- and gravel-sized material, and where sources of stratified sand and gravel are scarce, the coarse till may sometimes be crushed and used as a source of road-surfacing material. End moraines may present excavation difficulties during the building of roads and structures due to the abundance of small and large boulders.

3.5 GROUND MORAINE (MG):

3.5.1 Description:

The term ground moraine (MG) refers to an extensive deposit of till forming an undulating to rolling plain. Although till is generally composed of an assortment of particle sizes (including clay, silt, sand, gravel, cobbles, and boulders), till deposits in this map-area have a high sand and boulder content. The thickness of till in ground moraine varies from less than 1 m to many tens of metres. The landform is mapped MG where the till is thick enough to mask any topographic effect of underlying bedrock.In general, the till layer forms a mantle less than 3 m thick over the bedrock and is mapped as MG/R. Till in ground moraine tends to be thicker in bedrock depressions and thinner over bedrock ridges and knobs.

3.5.2 Occurrence:

Very little thick ground moraine is found in the Marmion Lake map-area. In many localities, it forms a generally thin cover over the bedrock (MG/R). Large areas where this situation occurs are located between Atikokan and the western margin of the map-area and in the northeastern part of the area. In both cases, the ground moraine occurs as a subordinate landform in association with bedrock knobs (RN(MG/R)), bedrock knobs and glaciolacustrine plain (RN(MG/R)(LP)), or bedrock knobs and glaciofluvial outwash (RN(MG/R)(GO/R).

3.5.3 Engineering and Planning Significance:

The till in ground moraine is coarse and bouldery, and has moderate permeability and internal drainage, low compressibility, and high bearing strength. Water table position varies with relief, being lower beneath knolls and low ridges and higher beneath depressions. The till in many of the depressions is covered by thin deposits of peat and muck.

The suitability of ground moraine for road and other light foundation construction is fair to good. The fact that the till often forms only a thin mantle over the bedrock (MG/R) has a great deal of significance in road building. Road construction through this type of terrain is difficult owing to the bouldery nature of the till and the probability of encountering bedrock in cuts. The suitability of ground moraine for waste disposal varies from poor to fair.

3.6 HUMMOCKY MORAINE (MH):

3.6.1 Description:

Although some hummocky moraine deposits formed along an active ice front, most of the sediments which make up this landform accumulated on the surface of stagnant glacial ice. In time, the buried ice melted and deposited a layer of unsorted till and, in places, washed glacial debris. Most hummocky moraine consists of steep-sided knobs and short ridges separated by undulating to flat plain and swampy kettle hole basins. Soil materials in hummocky moraine include till, usually as the dominant constituent, and subordinate amounts of stratified silt, sand, and gravel in pockets or lenses. Hummocky moraine can be very bouldery. Scattered kames (GK) are a common subordinate landform.

3.6.2 Occurrence:

Hummocky moraine forms a thin mantle over bedrock (MH/R) around Dashwa Lake in the northwestern part of the map-area. This deposit, which lies immediately north of the Eagle-Finlayson Moraine, is generally very bouldery and has moderate to high relief. Because bedrock is so near the

surface, some of the larger knobs of hummocky moraine probably have a bedrock core. Scattered kames occur as a subordinate landform (MH/R(GK)).

3.6.3 Engineering and Planning Significance:

Engineering considerations include the large quantities of material that may have to be excavated during construction, a high content of boulders, and rapid changes in the nature of the materials. Pockets of sand and gravel constitute small sources of construction material of variable quality.

Although variable, most areas of hummocky moraine have moderate permeability and internal drainage, low compressibility, high bearing strength, and low shrink-and-swell potential. In depressions, the till deposits are commonly covered by thin water-laid silt and clay, which in turn are overlain by peat and muck deposits. Hummocky moraine is considered fair to poor for general construction purposes and for waste disposal.

3.7 ICE-CONTACT DELTA (GD):

3.7.1 Description:

Esker deltas, kame deltas, and delta moraines are all varieties of the ice-contact delta. Some are quite large in area and important in terms of the volume of recoverable sand and gravel which they contain. Individual beds, consisting mainly of sand or gravel, are usually better sorted, cleaner, and less variable than stratified deposits in esker (GE) and kame (GK) landforms. The beds in this unit are also typically less folded and faulted and are more continuous. It is worth noting that materials in many ice-contact deltas are coarse (*i.e.* gravelly) on the north and northeast sides and finer (*i.e.* sandy) on the south and southwest sides. These conditions indicate the parts of the delta which are, respectively, closest to and farthest from the glacial front against which the delta was built.

3.7.2 Occurrence:

Much of the Eagle-Finlayson Moraine (Figure 1) in the Marmion Lake map-area consists of flat-topped, lobate-shaped ice-contact deltas. One particularly large deposit is located near Turtle Lake and Clearwater Lake in the northwest corner of the area. A fairly common elevation for the flat-topped ice-contact delta surfaces in this area is about 455m. Smaller occurrences are found south of the eastern end of Eye Lake and west of Finlayson Lake. In some instances, the landform appears to have been modified by wave action along its steeply sloping frontal margin. Other deltaic landforms are located east and northwest of Sapawe Lake in the central part of the map-area and east of French Lake in the eastern part. All of these granular landforms lie at elevations of 440 to 455 m.

3.7.3 Engineering and Planning Significance:

Ice-contact deltas are good potential sources of concrete and blacktop aggregate. They are also favorable sites for the construction of airstrips, roads, and other types of engineering works. Because the subsoils are highly permeable, deltaic landforms are relatively poor areas for waste disposal. Larger deposits, however, are generally good ground water prospects, especially where sand and gravel horizons are thick and extend below the water table. Ice-contact deltas possess high bearing strength and good workability in wet weather. Slopes are stable and subsoils are well drained. Away from the steeply sloping margins of this landform, earthwork volumes and excavation costs are normally low. Reservoirs and sewage lagoons in ice-contact deltas must be lined to prevent excessive leakage.

3.8 KAME (GK):

3.8.1 Description:

Kames occur either as steep-sided single knobs or as clusters of several knobs in kame fields and kame moraine. The larger, steep-sided kames usually have an irregular surface; in a few places, they contain deep kettle hole depressions. Most are composed of complexly interbedded sand and gravel strata which regularly exhibit fold, fault, and pinch-out

structures. Kames also contain variable but usually minor amounts of silt, till, and boulders. Large kame deltas are discussed in Section 3.7; kame terraces are rare.

3.8.2 Occurrence:

Isolated kames and kame moraine (GK) are commonly found in association with bouldery till in end moraine (GK(ME)). North of Pickerel Lake, the Eagle-Finlayson Moraine and Steep Rock Moraine (Figure 1) both contain kame units. The Eagle-Finlayson Moraine also contains a kame unit where it passes south of Turtle Lake in the northwest corner of the area. Other kame deposits are scattered throughout the map-area; most of them occur as a subordinate landform in rock knob terrain (RN(GK)). In a few places, isolated kames occur as a subordinate landform in hummocky moraine (MH(GK)). In this complex terrain unit, some of the knobs have a core of bedrock, while others consist entirely of layered sand and gravel. Kames occur with eskers in a small unit south of the eastern end of Eye Lake in the northwest-central part of the map-area.

3.8.3 Engineering and Planning Significance:

In general, kames have high permeability and good internal drainage, low compressibility, high shear strength, and good bearing capacity. Position of the water table varies with relief, being nearer the surface beneath kettle depressions and deeper beneath ridges and knobs. Although the granular materials in kames provide good foundations for buildings and small engineering works, the quantities of material that must be excavated during construction can be moderately high. Waste disposal sites require special design procedures and costly construction in order to function properly. Kames should be avoided as waste disposal sites. They vary from poor to good as sources of sand and gravel aggregate, depending upon their size and compositional variability.

3.9 OUTWASH PLAIN (GO):

3.9.1 Description:

Outwash deposits include plains, fans, deltas, and valley trains of varying sizes, all consisting mainly of sand and gravel. Most outwash sediments were drained from the front of a melting glacier and accumulated in flooded lowlands and valley bottoms. Although most outwash deposits were formed in proglacial positions, some accumulated over masses of stagnant glacier ice, resulting in pitted or kettled surface. Outwash landscapes that show abandoned channel scars, braid bars, or deep kettle holes are commonly coarse in texture (*i.e.* gravelly and cobbly rather than sandy).

3.9.2 Occurrence:

Outwash deposits occur near Turtle Lake and Clearwater Lake in the northwest corner of the map-area, at an elevation of approximately 440 m. Along the Seine River in the west-central part of the area, the outwash sediments form a thin, discontinuous mantle over the bedrock. A complex outwash-kame unit (GO-GK) occurs north of Olifaunt Lake in the southern part of the area. Northeast of Eva Lake in the eastern part of the area, thin outwash deposits overlie a bedrock plain. Subordinate landforms commonly associated with outwash in this map-area are bedrock knobs (RN), alluvial plains (AP), and organic terrain (OT).

3.9.3 Engineering and Planning Significance:

Outwash landforms almost always have a high permeability and good internal drainge, low to very low compressibility, low shrink-and-swell tendencies, and high shear strength and bearing capacity, particularly where these granular deposits are confined. Granular materials in outwash landforms form stable slopes and are seldom susceptible to frost heave. Being level and well drained, the sediments in outwash plains are not easily eroded by running water. The boulder content is generally low. A high water table can be expected beneath kettle depressions. Extensive outwash plains provide excellent sites for the construction of roads and airstrips, and are often good sources of concrete and bituminous aggregate.

They are good potential sites for ground water development, particularly where the granular deposits are deep and are recharged by water from nearby lakes and rivers.

3.10 GLACIOLACUSTRINE PLAIN (LP):

3.10.1 Description:

Sediments in glaciolacustrine plains consist of varved and massive, fine-grained materials deposited in glacial lake basins of varying size and depth. The proportions of clay, silt, and sand deposited at any particular location in these basins varies with depth of water in the former lake, distance from former shorelines, and the size of particles washed into the lake. Most clay, silt, and sand lacustrine deposits contain minor inclusions of till and scattered dropstones which were rafted into the lake on pieces of ice. In places, wave and current action in former glacial lakes eroded the surface of till deposits, producing thin patches of washed sand, gravel, and boulders that rest on till or bedrock. In other areas, bedrock knobs and ridges are surrounded by pockets of glaciolacustrine sediment. Glacial lake deposits usually consist of clay and silt (cLP, cmLP, mcLP) which accumulated in deep offshore waters at a depth where the bottom was no longer affected by wave action. Closer to shore, and at points where rivers discharged sandy materials into the lake, the deposits usually consist of fine and medium sand with minor silt (sLP, smLP). Most of these sandy lacustrine deposits accumulated in deltaic environments.

3.10.2 Occurrence:

Glaciolacustrine sand and clay plains (sLP, cLP) occur in the Marmion Lake map-area. Most clay deposits are located between the Eagle-Finlayson Moraine and Highway 11 in the western half of the area. Pockets of clay occupy depressions in the irregular bedrock surface and occur along drainageways. These clay deposits are commonly overlain by peat and muck (OT). The Town of Atikokan is situated on glaciolacustrine silt and clay. The deposits in this locality are typical of almost all clays in the Marmion Lake map-area. Small occurrences of clay and clay-silt lacustrine plains are scattered throughout the southeastern quarter of the area. Lacustrine clay deposits in this map-area lie at elevations of 395 to 410 m.

The glaciolacustrine deposits located in the extreme southeastern corner of the map-area, around Finlayson Lake in the northern part, and around the Seine River in the northeastern part consist mainly of sand or silty sand (sLP, smLP). The deposits in the southeastern corner of the area occur at elevations of 425 to 440 m.

Subordinate landforms commonly associated with all glaciolacustrine plains in the Marmion Lake map-area include bedrock plains (RP), bedrock knobs (RN), and organic terrain (OT).

3.10.3 Engineering and Planning Significance:

Glaciolacustrine clay deposits (cLP) have high water retention capacity, low permeability, and poor internal drainage, most of which is controlled by a network of closely spaced joints. Characteristically, these landforms possess low density, low bearing strength, and moderate to high compressibility, unless the fine-grained sediments have been consolidated by the weight of overriding glacier ice or by desiccation. The clay sediments usually provide poor foundation conditions and can be difficult to work with heavy construction equipment during wet weather. Most clay plains in the map-area are level to gently sloping. The sides of river valleys which have been deeply incised into these fine deposits are usually highly dissected and are susceptible to rill-and-gully erosion on freshly cut ditch and highway back slopes. Higher and steeper natural and man-made slopes are subject to small failures. Where these lacustrine materials carry a high proportion of silt or very fine sand, they are susceptible to frost heave and the formation of frost boils. Subsoil permeability ranges from low to nearly impervious; as noted above, this is largely dependent on the presence of a system of closely spaced joints. In locations where glaciolacustrine clay sediments are highly plastic, they have a tendency to shrink or swell with changes in moisture content. Bearing capacity, shear strength, and compressibility vary greatly with differences in previous loading history and, therefore, the natural moisture content. Bearing capacities can be low in wet areas, particularly where plastic clay soils are normally consolidated or only slightly consolidated.

Low-lying clay plains have a high water table and are subject to local flooding during spring runoff and heavy cloudbursts. During wet weather,

the glaciolacustrine clay sediments have poor workability characteristics for building roads and structures. This landform usually provides good sites for waste disposal because of its low permeability.

Lacustrine sand plains (sLP) contain mostly fine and medium sand with minor silt. Coarse sand, gravel, cobbles, boulders, and till are rare in these deposits. Sand plains are gently sloping to undulating and are well drained. A high water table may occur at sites located some distance from the ground water lowering effects of deep valleys and ravines. Sandy lacustrine materials are typically nonplastic and have high permeability, low compressiblity, moderate to high bearing capacity, and high shear strength. They are generally not frost susceptible unless they contain a significant amount of silt and very fine sand. They represent fair to good terrain for most construction, especially that of roads and airstrips. They are poor for waste disposal due to the possibility of effluent seepage and ground water contamination.

3.11 ALLUVIAL PLAIN (AP):

3.11.1 Description:

Many alluvial deposits (AP) in this map-area consist of fine and medium sand at depth; these materials are commonly overlain by a silty upper stratum of variable thickness. Oxbows and abandoned channel segments occur where meandering streams cross landforms composed largely of loose silt and fine sand. Sediments beneath alluvial plains are finer textured where the material being carried by the stream was eroded from clay and silt glaciolacustrine deposits. The landform includes flood plains that have been eroded in till and are strewn with boulders, as well as segments of stream valleys where alluvial sediments range in texture from coarse sand to coarse gravel and cobbles. Long and complex alluvial plain systems sometimes include three constituent landforms: low alluvial terraces, alluvial flood plains, and stream channels.

3.11.2 Occurrence:

A large alluvial deposit is located along the Seine River in the northeastern part of the map-area. Small alluvial plains occur along the Cache River and its tributaries in the southeastern corner of the area.

3.11.3 Engineering and Planning Significance:

Alluvial plains are subject to flooding. The water table is usually situated at or near the surface for much of the year; organic-filled depressions are common. Although some alluvial terraces, flood plains, and channel bottoms represent potential sources of sand and gravel for construction purposes, the high water table may cause problems during excavation of such materials. This landform is generally unsuitable for transportation routes, general construction, or waste disposal sites because of the high water table and risk of flooding.

3.12 ORGANIC TERRAIN (OT):

3.12.1 Description:

Organic terrain includes varying depths of peat and muck in marshes, swamps, fens, and bogs. No attempt was made to separate these organic landscape types during the mapping. Although peat and muck deposits usually occur as relatively thin surficial layers, in places these organic materials can be several metres thick. Moreover, the thickness of the deposits can change drastically over very short distances.

3.12.2 Occurrence:

Because irregular bedrock terrain is widespread in the Marmion lake map-area, organic terrain is common. The reason is that bedrock surrounding hollows has a low permeability, so that surface waters are ponded, become stagnant, and are eventually invaded by peat-forming vegetation. Peat deposits tend to be thicker in the Marmion Lake map-area than in adjacent areas due to the depth of hollows in the irregular bedrock terrain. Organic terrain (OT) is usually the dominant landform in sizeable depressions in the bedrock landscape. Examples of this situation occur throughout the map-area, but particularly in that half of the area lying south of the Eagle-Finlayson Moraine. Commonly associated subordinate landforms include bedrock knobs (RN), bedrock plains (RP), glaciolacustrine plains (LP), and alluvial plains (AP). Organic terrain can also occur as a subordinate landform in units dominated by any of the bedrock landforms (e.g. RN(OT), RR(OT), RP(OT).

3.12.3 Engineering and Planning Significance:

Although organic deposits are commonly thin, they are nonetheless very poor foundation and construction materials. The water table is at or near ground surface for most of the year. The locations of deeper pockets of organic material are difficult to predict reliably without extensive test-drilling. The topography of organic terrain is level or slightly depressional. Peat and muck deposits have low shear and bearing strengths and generally low permeability. They are nearly always poorly drained, highly compressible, and are subject to seasonal flooding. Consequently, they are unsuitable for nearly all types of engineering works and for waste disposal.

4.0 EXAMPLE OF DERIVED MAP: TERRAIN CONDITIONS FOR GENERAL CONSTRUCTION

The Terrain Conditions for General Construction Map (OGS Map 5104) included in this report has been derived from the Data Base Map (OGS Map 5073, accompanying this report). The purpose of this derivative map is to illustrate how the basic terrain data can be used for general engineering and construction purposes.

Typical projects that fall under the category of general construction include location and construction of highways, overhead transmission lines, timber storage sites, town sites, work camp sites, cottage subdivisions, and airfields.

Reference should be made to the "Ontario Engineering Terrain Study Users' Manual" (Gartner, Mollard, and Roed 1980) for further information on the preparation and use of the various types of derivative maps.

4.1 CAPABILITY RATING CRITERIA:

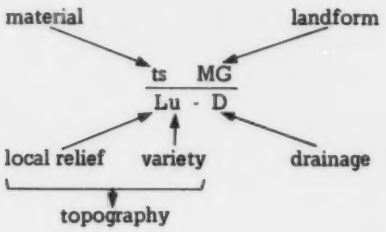
Criteria for rating the capability of a terrain unit for engineering uses are related to landform type, engineering properties of the constituent materials, and associated topography and drainage conditions. A section on the engineering and planning significance of each landform group is provided in this report. This information can be used to rate the capability of landforms for general construction or other engineering uses. In addition to the above, the marginal notes on the Terrain Conditions for General Construction Map outline the engineering criteria used in rating the terrain units for general construction capability.

5.0 APPENDIX: EXAMPLES OF TERRAIN UNIT LETTER CODES:

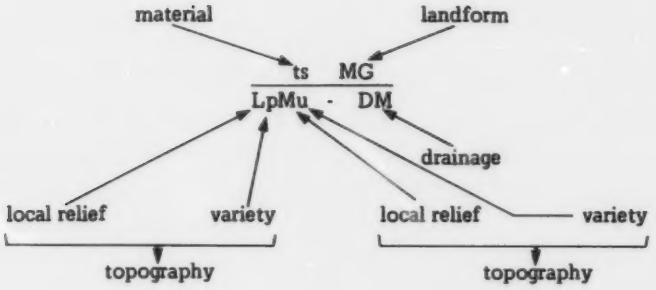
The engineering terrain unit letter codes consist of four components: surface materials, landform, topography, and drainage. The format of the letter codes used in describing the terrain units is discussed in detail in the Users' Manual (Gartner, Mollard, and Roed 1980). Some additional examples of the letter codes are as follows:

5.1 SIMPLE TERRAIN UNIT:

Example 1:



Example 2:

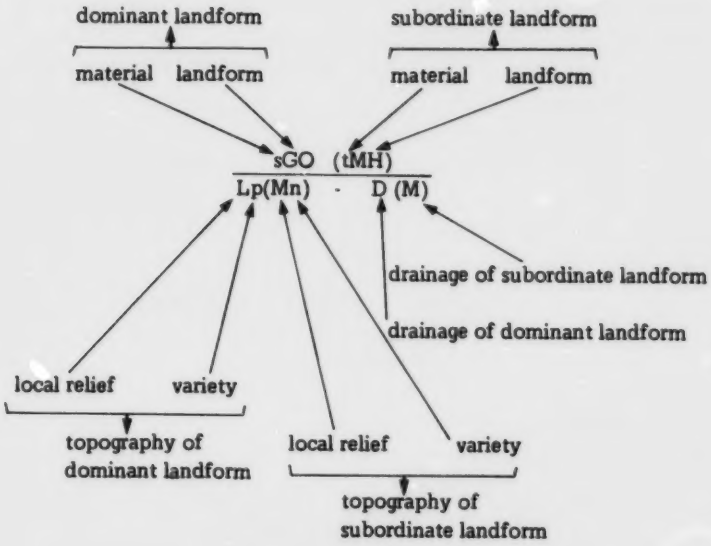


Note: The above type of letter code is used where there are two distinctly different types of topography and/or drainage in a simple terrain unit.

5.2 COMPLEX TERRAIN UNIT:

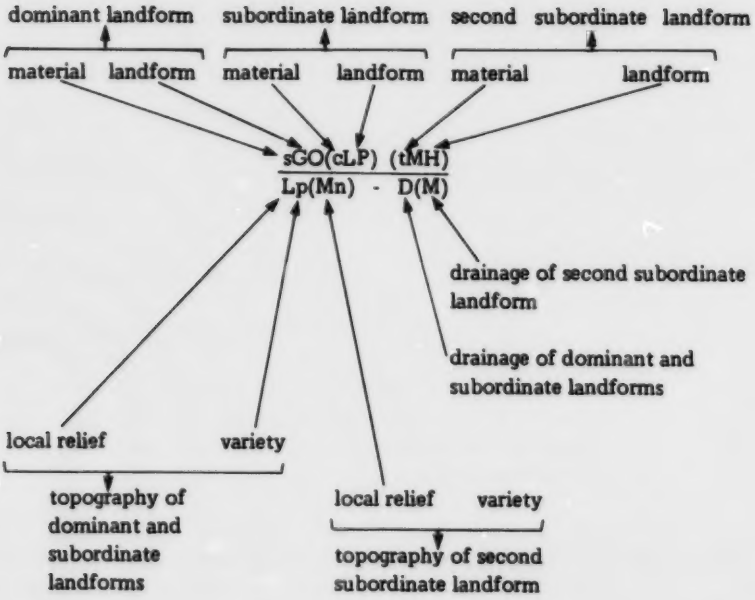
In complex areas, the dominant landform is shown first and the subordinate landform(s) appear in parentheses.

Example 1:



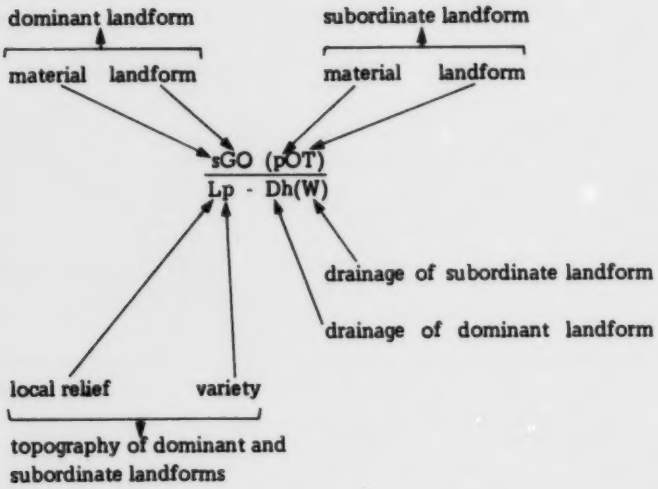
Note: The topography and drainage in parentheses refer to the landform shown in parentheses.

Example 2:



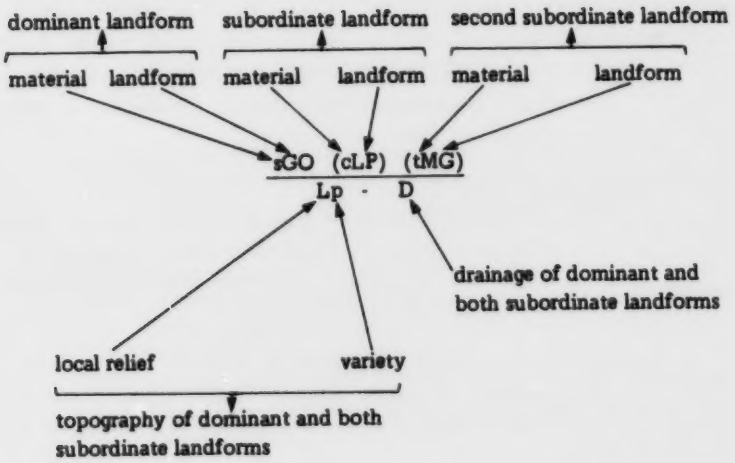
Note: The topography and/or drainage in parentheses refer to the second subordinate landform (in parentheses).

Example 3:



Note: If topography or drainage is similar in the dominant and subordinate landforms, then no topography or drainage symbol is shown in parentheses and the symbol shown applies to both landforms. If topography or drainage conditions are different in one of the landforms, a topography or drainage symbol is shown in parentheses to indicate this difference.

Example 4:



Note: Where topography and drainage conditions are similar in all of the landforms shown, no topography or drainage symbols are placed in parentheses.

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MAPS
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